

I CLAIM AS MY INVENTION:

1. In a battery conditioning system,
rechargeable battery means for supplying
operating current during a number of hours of
portable operation so as to become progressively
discharged as a result,
memory and communications means
for operative association with the rechargeable
battery means and receiving power from the
rechargeable battery means during portable
operation, and
battery conditioning system means
for coupling with said rechargeable battery means
and with said memory and communications means, for
conditioning of the battery means after a period of
portable operation and for the transmission of data
concerning said rechargeable battery means,
2. In a battery conditioning system according to
claim 1, said battery conditioning system means obtaining a
measured value of battery capacity of the rechargeable battery
means and transmitting data concerning the measured value of
battery capacity to said memory and communications means for
storage thereby and for use during portable operation.
3. In a battery conditioning system according to
claim 2, said rechargeable battery means having battery current

drain sensing means for accumulating a measure of current drain of the battery means during portable operation.

4. In a battery conditioning system according to claim 1, a computerized portable unit of size and weight to be held in one hand during use and containing said rechargeable battery means during portable operation and having battery current drain sensing means for accumulating a measure of current drain of the battery means during portable operation.

5. In a battery conditioning system according to claim 4, remaining battery capacity determining means carried with said computerized portable unit and comprising said memory and communications means and said battery current drain sensing means, and determining a measure of remaining battery capacity at different times during portable operation from a stored measured value of battery capacity and from a measure of accumulated battery current drain, such that as remaining battery capacity is progressively reduced as a result of use during such portable operation, the measure of remaining battery capacity supplied by said battery capacity determining means is correspondingly reduced.

6. In a battery conditioning system according to claim 1, battery current drain sensing means for providing a measure of current drain of the battery means during portable operation.

7. In a battery conditioning system according to claim 6, said battery current drain sensing means comprising resistance means in series with said battery means.

8. In a battery conditioning system according to claim 6, said battery current drain sensing means comprising integration means for accumulating a measure of current drain integrated with respect to time.

9. In a battery conditioning system according to claim 6, said memory and communications means having computer means coupled with said battery conditioning system means for arithmetically processing a measure of current drain and a stored measured value of battery capacity to provide an indication of currently remaining battery capacity.

10. In a battery conditioning system according to claim 1, said battery conditioning system means effecting a charging and discharge of the battery means to obtain a measured value of battery capacity, and comprising means for transmitting the measured value of battery capacity to said memory and communications means for storage thereby during portable operation.

11. In a battery conditioning system according to claim 1, said battery conditioning system means comprising computer means having two-way communication with said memory and communications means for obtaining data therefrom prior to a

conditioning operation and for supplying data thereto after a conditioning operation.

12. In a hand-held device,
battery means for supplying operating
current during a number of hours of portable
operation so as to become progressively discharged
as a result,
battery current sensing means coupled
with said battery means for sensing battery current
during use, and
computer means coupled with said
battery current sensing means and receiving data
therefrom during portable operation,
said computer means having memory means for storing data which is
a function of the integral of battery current with respect to
time during portable operation, such that an estimate of
remaining useful life of the battery means is available from said
computer means during portable operation.

13. In a hand-held device according to claim 12, said
computer means having communications means for enabling
communication of data concerning the battery means.

14. In a hand-held device according to claim 13, said
communications means enabling communication with a battery
conditioning station of a measured value of battery capacity of
the battery means.

15. In a hand-held device according to claim 13, said communications means providing two-way communication with a battery conditioning station.

16. In a hand-held device according to claim 12, display means for displaying data to a user during portable operation and coupled with said computer means for the display of battery information during portable operation.

17. In a battery conditioning system, a portable battery powered utilization device of size and weight to be held in one hand during use, and operating from battery power during portable operation thereof, battery means operatively coupled with said utilization device for supplying operating power thereto during portable operation, battery conditioning system means coupled with said utilization device during conditioning operation and operatively coupled with said battery means and comprising battery conditioning means for effecting conditioning of said battery means, and battery parameter sensing means for sensing a battery parameter, said battery conditioning system means including computer operating means operatively coupled with said battery conditioning means and controlling conditioning of said battery means in conjunction with said battery parameter sensing means.

18. In a battery conditioning system according to claim 17, said battery conditioning system means comprising a semiconductor chip containing said computer operating means and having battery parameter input means coupled with said battery parameter sensing means for receiving data as to a parameter of said battery means, and having battery control output means for supplying a battery control signal for controlling supply of charging current to said battery means at least partially in accordance with the data from the battery parameter sensing means.

19. In a battery conditioning system according to claim 18, said battery parameter sensing means sensing battery current, and supplying a measure of sensed battery current to said battery parameter input means of said computer operating means, and said battery control output means varying a battery charging current characteristic so as to tend to maintain the measure of sensed battery current as supplied to said battery parameter input means at a selected value.

20. In a battery conditioning system according to claim 17, said computer operating means having communications means for the transmission of data concerning said battery means to a remote station.

21. In a battery conditioning system according to claim 17, said battery conditioning system means being responsive to a computer generated control signal from the computer operating

means, and controlling the supply of charging current to said battery means during a conditioning operation in accordance with said computer generated control signal.

22. In a battery conditioning system according to claim 21, said battery conditioning system means comprising a charging current control circuit for receiving a control signal and for controlling the supply of charging current to said battery means according to said control signal, and control signal generating means for generating a default value of said control signal in the absence of a computer generated control signal from the computer operating means, and said computer operating means being coupled with said control signal generating means for altering the value of charging current away from said default value according to a computer generated control signal from said computer operating means.

23. In a battery conditioning system according claim 22, said computer operating means having digital to analog converter means for receiving a computer generated control signal therefrom and for supplying an analog output signal to said control signal generating means for overriding the default value of said control signal according to the computer generated control signal from the computer operating means.

24. In a battery conditioning system according to claim 23, said control signal generating means comprising a resistance network supplied with a charging potential of said battery

conditioning system means during a battery charging operation, so as to supply a default value of said control signal, and said digital to analog converter means being coupled with said resistance network so as to alter the control signal according to a computer generated control signal supplied to said digital to analog converter means by said computer operating means.

25. In a battery conditioning system according to claim 21, said battery parameter sensing means providing a measure of battery temperature to said computer operating means, and said computer operating means providing a computer generated control signal in accordance with a measure of battery temperature.

26. In a battery conditioning system according to claim 21, said battery parameter sensing means providing measures of battery temperature and battery terminal voltage to said computer operating means, and said computer operating means providing a computer generated control signal in accordance with said measures of battery temperature and battery terminal voltage.

27. In a battery conditioning system according to claim 17, said computer operating means having communications means for the transmission of data concerning said battery means, said communications means comprising digital to analog converter means in said utilization device and controlled by said computer operating means for supplying an analog output signal to said battery conditioning means.

28. In a battery conditioning system according to claim 27,, said battery conditioning means comprising an external battery charging circuit external to said utilization device, and having a control signal generating means for establishing a default value of battery charging current to be supplied by said circuit in the absence of an analog output signal from said digital to analog converter means.

29. In a battery conditioning system according to claim 27, said computer operating means supplying a computer generated control signal to said digital to analog converter means in accordance with the rated capacity of said battery means.

30. A portable battery powered system comprising a portable battery powered utilization device operating from battery power during portable operation, battery means operatively coupled with said utilization device for supplying operating power thereto during portable operation, and conditioning control means comprising computer operating means having computer output means for coupling with an external battery conditioning circuit during conditioning of the battery means.

31. A portable battery powered system according to claim 30, with said computer operating means of said portable utilization device supplying a computer generated control signal

according to rated battery capacity of said battery means, to an external battery charging circuit to control charging current supplied to said battery means during battery charging operation.

32. A portable battery powered system according to claim 30, with said computer operating means of said portable utilization device supplying a computer generated control signal according to a measure of battery temperature, to an external battery charging circuit to control the charging current supplied to said battery means during battery charging operation.

33. A portable battery powered system according to claim 30, with said computer operating means of said portable utilization device supplying a computer generated control signal according to a measure of battery terminal voltage, to an external battery charging circuit to control the charging current supplied to said battery means during battery charging operation.

34. A portable battery powered system according to claim 30, with said computer operating means of said portable utilization device supplying a computer generated control signal according to the charge condition of the battery means, such that a fast charge rate and a slow charge rate are selectively established according to the charge condition of the battery means at the initiation of a battery charging operation.

35. A portable battery powered system according to claim 30, with said computer operating means maintaining a measure of battery usage during portable operation and supplying

a computer generated control signal according to such measure of battery usage at the initiation of battery conditioning operation.

36. A portable battery powered system according to claim 35, with said computer operating means maintaining a measure of battery usage without directly sensing battery current, such that resistance in series with the battery means is avoided.

37. A portable battery powered system according to claim 30, with said computer output means comprising digital to analog converter means for receiving a computer generated control signal from the computer operating means and for supplying an analog output signal to an external battery current supply circuit so as to control the value of charging current supplied to said battery means.

38. A portable battery powered system according to claim 37, with battery parameter sensing means providing a measure of battery temperature to said computer operating means, and said computer operating means providing a computer generated control signal in accordance with such measure of battery temperature.

39. A portable battery powered system according to claim 37, with battery parameter sensing means providing measures of battery temperature and battery terminal voltage to said computer operating means, and said computer operating means

providing a computer generated control signal in accordance with said measures of battery temperature and battery terminal voltage.

40. A portable battery powered system according to claim 30, with said computer output means comprising digital communication means for the transmission of data concerning said battery means to an external battery conditioning circuit.

41. The method of conditioning a portable utilization device containing rechargeable battery means and data storage means, which comprises storing data which is a function of said battery means in the data storage means, coupling said portable utilization device with an external conditioning circuit for supplying charging current to the rechargeable battery means during a conditioning operation, and controlling the rate of charging of the battery means during a conditioning operation in accordance with the data stored in said data storage means.

42. The method of claim 41, further comprising storing data in said data storage means in accordance with rated battery capacity of said rechargeable battery means.

43. The method of claim 41, further comprising storing data in said data storage means in accordance with a measure of battery temperature.

44. The method of claim 41, further comprising storing data in said data storage means in accordance with a measure of battery terminal voltage.

45. The method of claim 41, further comprising storing data in said data storage means in accordance with a measure of usage of the device during portable operation.

46. The method of claim 41, further comprising storing data in said data storage means in accordance with a measure of the usage of the device during portable operation without reliance upon the sensing of battery current amplitude.

47. The method of claim 41, further comprising coupling with an external circuit providing for a default value of charging current, and overriding the default value according to the data stored in the data storage means.

48. The method of claim 41, further comprising controlling the rate of charging of the battery means in accordance with a measure of the load on the external charging circuit provided by the utilization device as well as the requirement for efficient recharging of the battery means.

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